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# report

MANPOWER STATISTICS DIVISION

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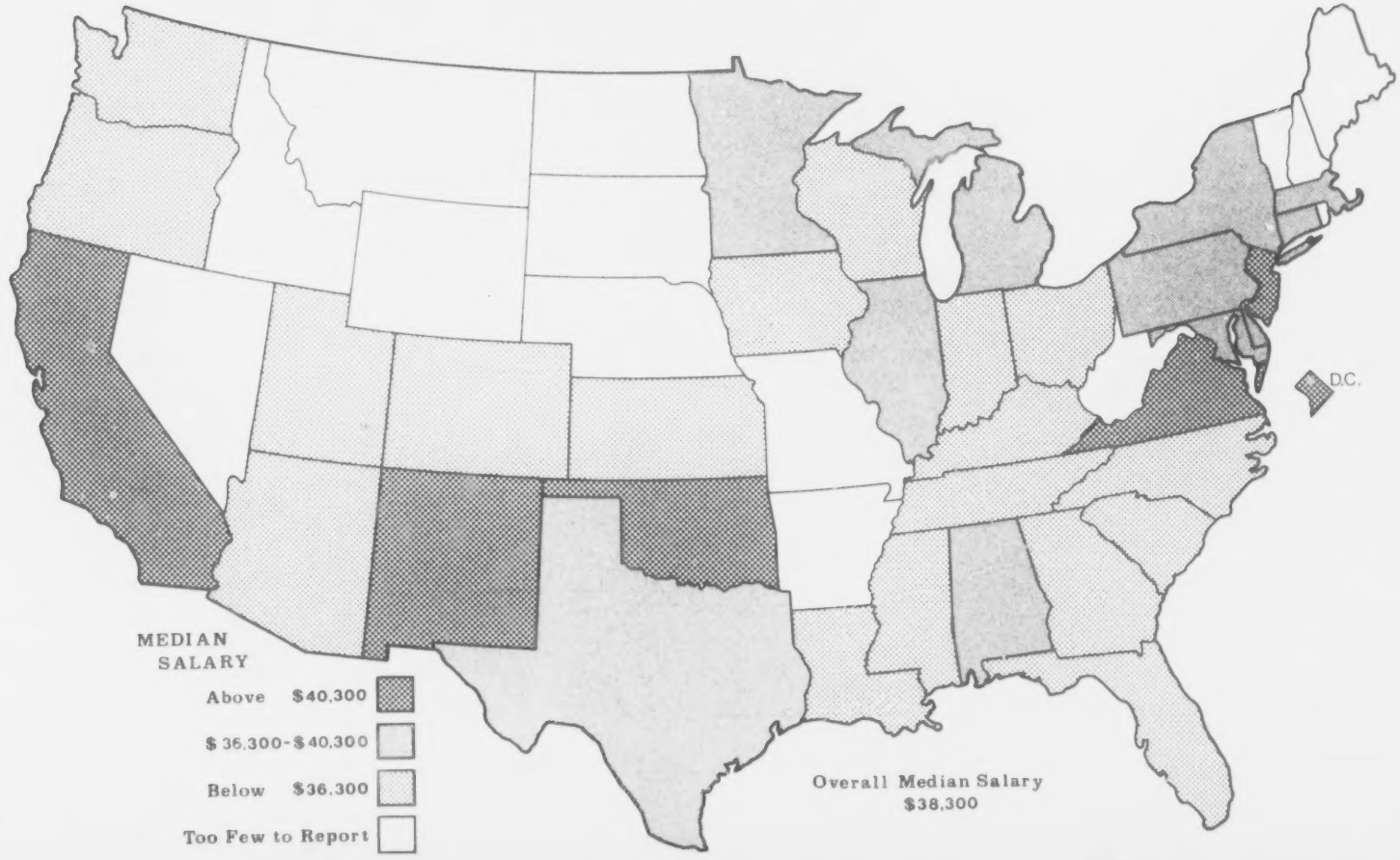
# 1982 SALARIES

## SOCIETY MEMBERSHIP SURVEY



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# 1982 SALARIES

## SOCIETY MEMBERSHIP SURVEY

*W. Keith Skelton, Beverly Fearn Porter and Roman Czujko*

**The American Physical Society**
**Optical Society of America**
**Acoustical Society of America**
**The Society of Rheology**
**American Association of Physics Teachers**
**American Crystallographic Association**
**American Astronomical Society**
**American Association of Physicists in Medicine**
**American Vacuum Society**

COVER

This figure illustrates variation in median salaries by state of residence. California and several states in the sunbelt and along the eastern coast maintain the greatest concentration of society members and the highest PhD salaries in the nation. Heavy representation of industry, government and National Laboratories within these states, and the higher salaries associated with such employment account for the salary distribution found within these areas. States where relatively low salaries are observed (the Plains and Southeastern states) generally have relatively few society members, most of whom are academically employed. Where shading is absent, there are too few society members to report reliable median salaries.

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## INTRODUCTION (1)

In 1982 the country faced a number of economic problems. Although inflation had been dampened to below 7%, unemployment was widespread. Interest rates were high and funding at the federal, state and local levels remained tight. While members of AIP member societies were not affected as heavily as some other segments of the labor force, particularly in terms of actual unemployment, they did feel the impact of this recessionary period. There was a contraction in job offers, both for new degree holders and for experienced scientists, and the median salary level of society members rose only modestly to $37,000 from the $35,000 observed in 1981.

There was, however, considerable variation both in salary levels and patterns of increase by geographic location, employer, type of work, position, degree level, years from degree and sex. The current report examines those variations and changes in the salaries of society members.

Graphics highlighting some of these and other major patterns observed are presented along with detailed tables and brief summary text. Requests for such detailed information on salaries have been so frequent that we decided this year for the first time to publish the salary data in a report separate from the annual membership report. If this format receives a positive reception we will continue it in future years and aim towards an earlier, spring publication date. Comments on the format and level of detail presented in this new report are therefore particularly welcome.

The data presented here are based on a sample survey of the U.S. members conducted in the spring of 1982. A random sample of society members was initially selected in 1979. It was expanded in 1981 to cover over one-sixth of the society members and stratified to represent more fully the three smaller AIP member societies. These members were contacted again in 1982 in addition to a random sample of individuals who had joined a society for the first time during 1981. The data are thus applicable to individuals whose membership was current as of 12/81. The overall response rate to the 1982 survey was 67%.

Most of the following discussion centers on median and quantile salaries which are the preferred descriptive measures of central tendency and variation in typically skewed salary distributions. The tables, however, also present for comparison the salary means and standard deviations along with the median ages of each group being examined. See Appendix B for definitions and technical notes on the measures used in this report.

In addition to descriptive material outlining the salary structure of society members in 1982, we have also presented some material on salary change between 1981 and 1982. Such change can be analyzed in several ways. The most typical comparisons are cross-sectional, e.g., comparing the 1982 median salary of industrially employed Ph.D's to the median salary of similarly employed individuals in 1981. From the point of view of an employer such comparisons reflect the going rate for such personnel and how this has changed from the previous year. Companies, universities and National Laboratories frequently seek such information in their desire to remain competitive in a changing labor market.

Cross-sectional analyses, as valuable as they are, reflect net changes; they do not examine the dynamics of salary change. For individual society members, or employers, seeking data on typical salary increases, they may be misleading. Longitudinal data, which looks at the same people at two or more points in time, provide a better picture of these actual increases. In this report, we have presented or commented on both types of salary change where possible.

Although we have not adjusted salaries for inflation to reflect real purchasing power, it should be noted that the rate of inflation between March 1981 and March 1982 was 6.8%. (2) Cost of living, which also affects purchasing power, varies in different sections of the country. Some attention has been paid to such variation in our discussion of salaries in major metropolitan areas.

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(1) Special acknowledgement is given to Barbara Larity for her valued assistance in the preparation and production of this report.

(2) The rate of inflation was quoted by the Bureau of Labor Statistics, CPI Division.

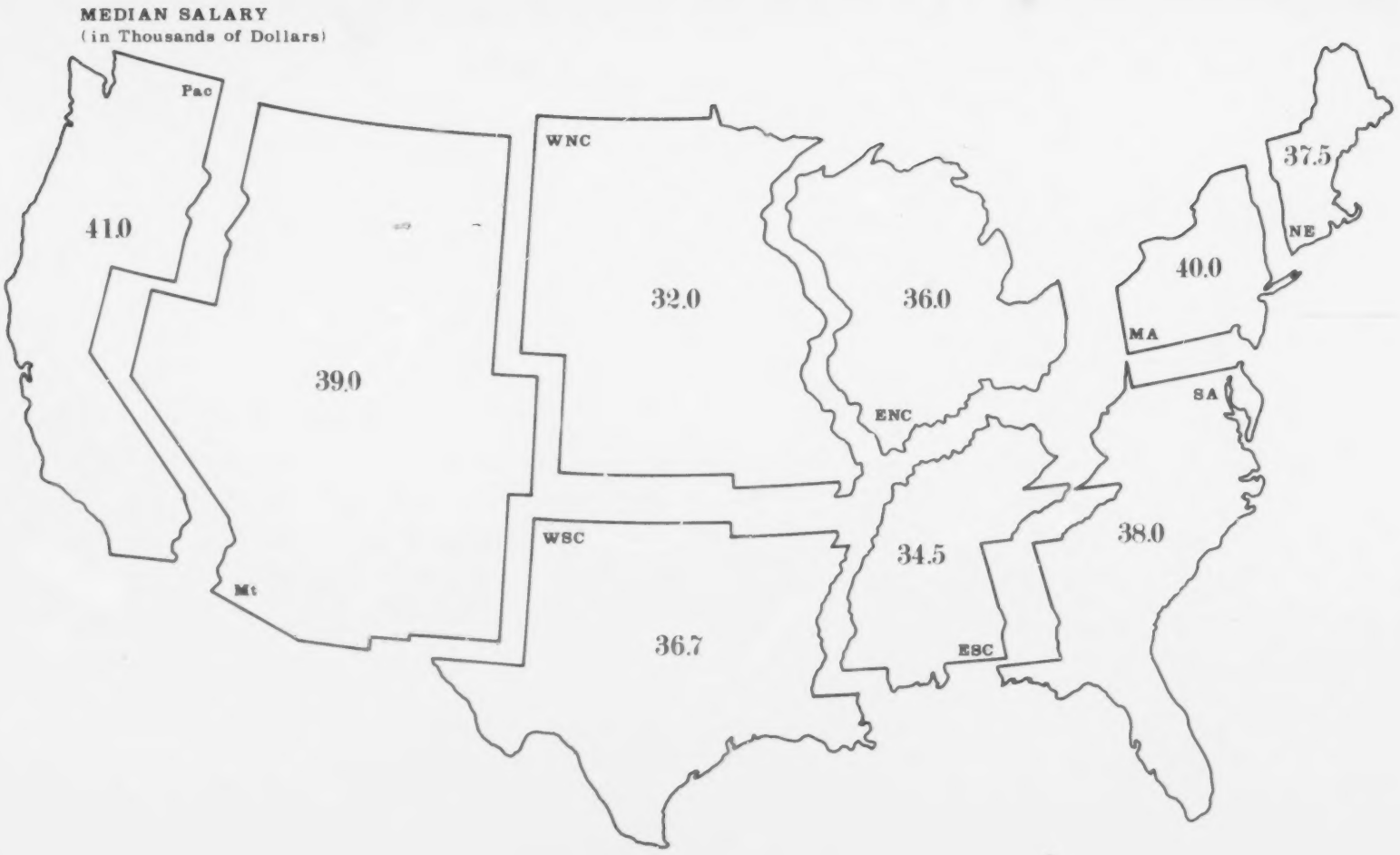


FIGURE 1. Variation in median salary for PhD's by region, 1982.

## SALARIES AND GEOGRAPHIC LOCATION

Regional variation in median salaries for PhD's was substantial, as illustrated in Figure 1, with extremes ranging from $32,000 in the West North Central up to $41,000 in the Pacific. While differences in salary can be attributed largely to the employer composition of each region, the small range in median age among regions suggests that age is not a major contributing factor in the national salary variation observed. In fact, the median age of members living in the western half of the country was slightly lower than for those in the east.

Table 1. 1982 salaries by geographic region, Ph.D.'s. (a)

| Geographic Region | Median Salary (in thousands of dollars) | Mean Salary | Standard Deviation | Median Age | Total Number Known | No Response |
|---|---|---|---|---|---|---|
| New England | 37.5 | 38.4 | 14.5 | 42 | 322 | 12 |
| Middle Atlantic | 40.0 | 40.9 | 14.4 | 42 | 682 | 31 |
| South Atlantic | 38.0 | 40.0 | 12.9 | 43 | 582 | 17 |
| East North Central | 36.0 | 37.5 | 12.8 | 44 | 465 | 18 |
| East South Central | 34.5 | 34.3 | 9.8 | 43 | 147 | 3 |
| West North Central | 32.0 | 32.3 | 11.6 | 41 | 162 | 3 |
| West South Central | 36.7 | 38.2 | 12.8 | 41 | 214 | 6 |
| Mountain | 39.0 | 40.7 | 14.0 | 41 | 324 | 7 |
| Pacific | 41.0 | 42.5 | 12.6 | 42 | 711 | 17 |

(a) see Appendix for state composition of each region.

Table 2. 1981 and 1982 salaries by geographic region, PhD's. (a)

| | Salary Year | Median Salary (in thousands of dollars) | Mean Salary | Standard Deviation | Median Age | Total Number Known |
|---|---|---|---|---|---|---|
| New England | 1981 | 35.5 | 36.6 | 11.9 | | |
| | 1982 | 39.7 | 39.7 | 12.8 | 43 | 251 |
| Middle Atlantic | 1981 | 38.0 | 39.3 | 14.7 | | |
| | 1982 | 40.8 | 41.7 | 14.7 | 43 | 514 |
| South Atlantic | 1981 | 36.0 | 37.5 | 10.5 | | |
| | 1982 | 38.8 | 40.5 | 12.3 | 43 | 468 |
| East North Central | 1981 | 35.0 | 35.8 | 11.9 | | |
| | 1982 | 37.3 | 38.4 | 12.4 | 45 | 363 |
| East South Central | 1981 | 32.2 | 32.6 | 8.8 | | |
| | 1982 | 35.0 | 34.5 | 9.9 | 44 | 113 |
| West North Central | 1981 | 31.0 | 31.4 | 10.7 | | |
| | 1982 | 33.0 | 33.2 | 11.4 | 41 | 121 |
| West South Central | 1981 | 34.0 | 34.8 | 13.5 | | |
| | 1982 | 37.5 | 38.2 | 12.4 | 42 | 163 |
| Mountain | 1981 | 35.0 | 36.2 | 10.8 | | |
| | 1982 | 39.0 | 39.8 | 11.8 | 42 | 250 |
| Pacific | 1981 | 38.0 | 39.2 | 11.5 | | |
| | 1982 | 42.0 | 43.0 | 12.3 | 43 | 528 |

(a) See Appendix for state composition of each region.

From Table 2, one may note that regional salary increases for PhD's between 1981 and 1982 clustered within two groups. The first group (North East, West South Central, Mountain and Pacific) received increases of 10 to 12%, well above the 6.8% inflation rate in effect during 1981-82. These represented salary increases of $3,500 to $4,200 in absolute dollar terms. It should be noted that these areas have a substantial representation of industry, government and National Laboratories, and last year experienced a relatively high level of inmobility by society members. The second group, with increases close to or maintaining a slight edge on inflation, encompassed the remaining regions. Here salaries increased by 6 to 9%, reflecting an absolute dollar increase of two to three thousand. With some exceptions, most of these areas are predominantly academic and last year many of these regions experienced relatively high net outmobility.

Employers, to remain competitive, need to pay salaries which reflect their city's cost of living. For this reason, some of the highest salaries will often be found in the most "expensive" cities. New York, Houston, and San Jose are excellent examples of this relationship, as illustrated in Figure 2. Failing to take this into account when making regional salary comparisons can be misleading, especially on the metropolitan scale. An attempt has been made here to give median salaries, adjusted for cost of living, for selected cities in the United States. The American Chamber of Commerce Researcher's Association's cost of living index measures prices for consumer goods and services within cities which volunteer this information. Large cities not represented in Figure 2, including Boston, Chicago, San Francisco, and the District of Columbia failed to respond to ACCRA's queries. The index is based on a national average of 100 units.

The academic/nonacademic proportion of respondents significantly influences salaries when examined on the city level. A heavy representation of industrial and/or federally employed individuals (Knoxville $37,900 and Albuquerque $41,200) will mean substantially higher salaries than those within cities where academically employed members are concentrated (Atlanta $34,600 and

Table 3. 1982 salaries and employer type distribution for selected states, PhD's. (a)

| | Median Salary (in thousands of dollars) | Mean Salary | Standard Deviation | Median Age | Total Number Known | Academic % | Industry % | Gov't % | FFR&DC % | Other % |
|---|---|---|---|---|---|---|---|---|---|---|
| Alabama | 37.0 | 35.3 | 10.7 | 45 | 22 | 75 | 9 | 16 | - | - |
| Arizona | 36.0 | 37.2 | 13.0 | 41 | 40 | 56 | 22 | 10 | 5 | 7 |
| California | 42.0 | 43.2 | 12.3 | 42 | 642 | 35 | 38 | 5 | 18 | 4 |
| Colorado | 36.0 | 39.2 | 15.4 | 42 | 89 | 49 | 24 | 17 | 7 | 3 |
| Connecticut | 38.9 | 37.8 | 14.2 | 40 | 66 | 54 | 32 | 9 | - | 5 |
| Delaware | 37.3 | 41.4 | 18.1 | 41 | 24 | 29 | 67 | - | - | 4 |
| D.C. | 47.0 | 45.4 | 10.3 | 44 | 117 | 6 | 4 | 83 | - | 7 |
| Florida | 35.7 | 35.3 | 11.2 | 45 | 46 | 74 | 11 | 10 | - | 5 |
| Georgia | 34.4 | 36.1 | 13.6 | 42 | 39 | 81 | 16 | 3 | - | - |
| Illinois | 37.8 | 38.6 | 12.3 | 42 | 175 | 52 | 16 | 1 | 29 | 2 |
| Indiana | 29.8 | 32.7 | 12.5 | 45 | 40 | 91 | 8 | - | - | 1 |
| Iowa | 32.0 | 30.8 | 8.6 | 41 | 26 | 73 | 8 | 4 | 15 | - |
| Kansas | 29.4 | 29.0 | 9.1 | 41 | 22 | 91 | 9 | - | - | - |
| Kentucky | 30.0 | 29.9 | 7.2 | 50 | 19 | 85 | 8 | 2 | - | 5 |
| Louisiana | 34.2 | 35.5 | 10.5 | 45 | 25 | 90 | 4 | 2 | - | 4 |
| Maryland | 38.2 | 39.2 | 11.3 | 40 | 164 | 32 | 14 | 47 | - | 7 |
| Massachusetts | 38.0 | 39.0 | 12.7 | 41 | 224 | 52 | 29 | 10 | 5 | 4 |
| Michigan | 38.0 | 39.7 | 13.6 | 44 | 93 | 61 | 34 | 1 | - | 4 |
| Minnesota | 37.8 | 36.9 | 13.2 | 39 | 48 | 46 | 52 | - | - | 2 |
| Mississippi | 33.3 | 31.8 | 9.9 | 42 | 38 | 90 | - | 10 | - | - |
| New Jersey | 44.3 | 45.1 | 12.8 | 40 | 190 | 22 | 67 | 4 | 6 | 1 |
| New Mexico | 42.2 | 44.5 | 13.2 | 41 | 149 | 9 | 5 | 11 | 75 | - |
| New York | 38.0 | 39.9 | 15.7 | 42 | 337 | 53 | 32 | 3 | 7 | 5 |
| North Carolina | 30.5 | 34.3 | 10.8 | 43 | 48 | 82 | 5 | 9 | - | 4 |
| Ohio | 36.0 | 37.3 | 12.7 | 45 | 108 | 55 | 30 | 8 | 2 | 5 |
| Oklahoma | 41.3 | 39.8 | 13.9 | 43 | 21 | 60 | 35 | - | - | 5 |
| Oregon | 27.7 | 36.1 | 16.1 | 47 | 21 | 79 | 21 | - | - | - |
| Pennsylvania | 37.2 | 38.1 | 12.0 | 42 | 155 | 59 | 29 | 6 | 1 | 5 |
| South Carolina | 32.3 | 30.0 | 9.0 | 44 | 14 | 93 | - | - | 7 | - |
| Tennessee | 35.8 | 35.6 | 9.8 | 41 | 95 | 33 | 5 | 1 | 61 | - |
| Texas | 37.6 | 38.7 | 13.1 | 41 | 163 | 56 | 42 | - | - | 2 |
| Utah | 33.0 | 35.6 | 13.0 | 42 | 23 | 81 | 19 | - | - | - |
| Virginia | 42.3 | 43.2 | 14.6 | 45 | 111 | 35 | 21 | 36 | 6 | 2 |
| Washington | 33.0 | 35.6 | 13.7 | 42 | 38 | 64 | 26 | - | 10 | - |
| Wisconsin | 30.0 | 33.8 | 12.3 | 44 | 47 | 79 | 18 | - | - | 3 |

(a) Several states were not included above because the number of respondents was too small to calculate reliable statistics.

FIGURE 2. Median salaries in each of 17 selected metropolitan areas for PhD's. Both actual salaries and salaries adjusted for cost of living are presented, 1982.

Madison $28,500). When high adjusted salaries are found in predominantly academic cities, they can be explained by the comparatively older age of the respondents. An example of this is Champaign, where all of the respondents work in academe. They have the second highest adjusted salary ($39,300) of the 17 cities. However, it should be noted that at 50 years of age they are the second oldest group observed.

Table 4. 1982 median salaries adjusted for cost of living in selected metropolitan areas. (a)

| | Cost of Living Index | Median Salary (in thousands of dollars) | Adjusted Salary | Median Age | Academic % | NonAcademic % | Total Number Known |
|---|---|---|---|---|---|---|---|
| Albuquerque, NM | 99.5 | 41.0 | 41.2 | 39 | 13 | 87 | 48 |
| Anaheim, CA | 110.6 | 40.7 | 36.8 | 46 | 42 | 58 | 31 |
| Atlanta, GA | 102.5 | 35.5 | 34.6 | 41 | 75 | 25 | 30 |
| Baltimore, MD | 106.2 | 38.4 | 36.2 | 40 | 32 | 68 | 48 |
| Champaign, IL. | 101.7 | 40.0 | 39.3 | 50 | 100 | - | 29 |
| Columbus, OH | 99.4 | 36.0 | 36.2 | 45 | 57 | 43 | 30 |
| Denver, CO | 109.8 | 37.6 | 34.2 | 44 | 49 | 51 | 56 |
| Houston, TX | 111.6 | 42.3 | 37.9 | 38 | 35 | 65 | 39 |
| Knoxville, TN | 98.7 | 37.4 | 37.9 | 41 | 15 | 85 | 71 |
| Madison, WI | 103.1 | 29.4 | 28.5 | 44 | 86 | 14 | 29 |
| Minneapolis/St. Paul, MN | 107.8 | 37.1 | 34.4 | 39 | 48 | 52 | 44 |
| New York, NY | 133.2 | 40.0 | 30.0 | 44 | 53 | 47 | 110 |
| Phoenix, AZ | 105.1 | 40.0 | 38.1 | 40 | 34 | 66 | 13 |
| Sacramento, CA | 103.3 | 40.0 | 38.7 | 51 | 100 | - | 12 |
| San Diego, CA | 114.7 | 42.3 | 36.9 | 42 | 20 | 80 | 48 |
| San Jose, CA | 117.2 | 43.6 | 37.2 | 39 | 24 | 76 | 34 |
| Syracuse, NY | 95.7 | 35.2 | 36.8 | 48 | 100 | - | 17 |

(a) Cost of Living Index from the American Chamber of Commerce Researchers Association, national average = 100.0

## SALARIES AND EMPLOYER TYPE FOR PhD'S

In 1982 the median salary for Ph.D's was $38,300, 6.4% higher than that observed in 1981. PhD's make up the bulk of the society membership, over two-thirds, and are employed in a broad diversity of work spheres, both academic and non-academic. Only in secondary schools and junior college do we find them so lightly represented that reliable salary data cannot be presented.

Ph.D's employed in industry commanded the highest median salaries, nearly $45,000 in 1982, while those employed in government and national labs drew salaries only somewhat lower at $43,000 and $42,000 respectively. However, it should be noted that industrially employed Ph.D's are among the youngest of the society members, while those employed by the government are older. Thus, the apparent similarity in salaries is in part due to government employees having been in the labor market longer.

Academic salaries, on either a 9-10 month or 11-12 month salary base, are considerably lower than those observed outside academe, with the lowest overall median salary, less than $25,000, being earned by those Ph.D's working in four-year colleges.

In comparison to last year, academic salaries in 1982 were only minimally higher, by one to two thousand dollars. In contrast, salaries at the National Laboratories appeared markedly higher, rising from $38,000 in 1981 to $42,000 in 1982.

### Salaries and Professional Experience

While overall median salaries provide a general picture of salary levels in different sectors of the economy, they are quite broad measures. Salaries vary considerably by professional age (years from highest degree) and the professional age structure varies from sector to sector. Doctorates on university and college

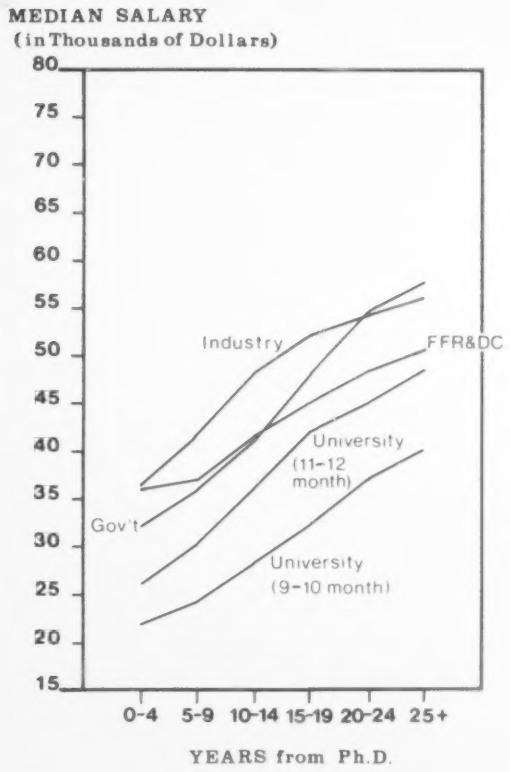


FIGURE 3. Median salaries for PhD's by type of employer and years from degree, 1982.

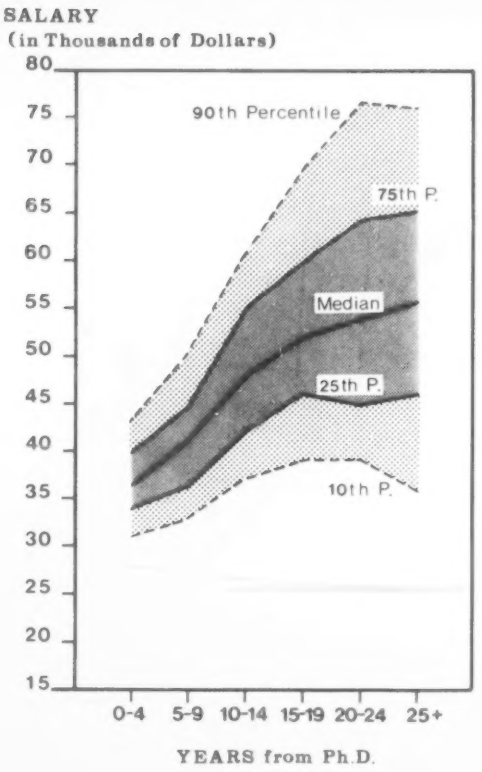


FIGURE 4. Salary structure in industry by years from PhD, 1982.

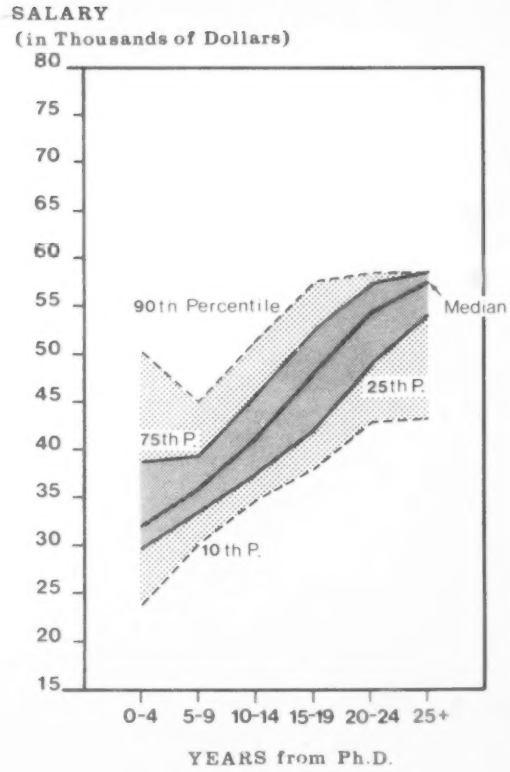


FIGURE 5. Salary structure in government by years from PhD, 1982.

staffs and those employed by government are notably older than those employed by industry and the National Laboratories. A clearer picture of the variation in salaries between employment sectors is thus best given by examining salaries by professional age as illustrated in Figure 3.

At every experience level, academic salaries are lower than those in government, industry and the National Laboratories. In most employment sectors, salaries increase steadily for the first fifteen years after the Ph.D and then level off to varying degrees. The major exception is found in government salaries. Although the median government salaries are lower than those in industry for the first 20 years after the Ph.D, they rise steeply at each experience level and actually surpass industrial median salaries at 20 years beyond the Ph.D. However, as will be noted further on, the entire salary structure in government is quite different than that

Table 5. 1982 salaries by major employer type, Ph.D's.

| | Median Salary | Mean Salary | Standard Deviation | Median Age | Total Number Known | No Response |
|---|---|---|---|---|---|---|
| | (in thousands of dollars) | | | | | |
| University | | | | | | |
| 9-10 Month Salary | 31.7 | 33.0 | 9.1 | 46 | 853 | 11 |
| 11-12 Month Salary | 34.0 | 35.4 | 13.5 | 40 | 596 | 11 |
| 4-Year Colleges | | | | | | |
| 9-10 Month Salary | 24.3 | 24.8 | 5.9 | 43 | 151 | 3 |
| Industry/Self-Employed | 44.8 | 47.4 | 13.6 | 40 | 980 | 44 |
| Government | 43.0 | 43.8 | 9.9 | 43 | 374 | 9 |
| FFR&DC | 42.0 | 43.4 | 11.4 | 41 | 433 | 15 |
| Nonprofit | 40.0 | 42.2 | 13.3 | 42 | 91 | 2 |
| Other NonAcademic | 46.5 | 46.5 | 13.6 | 41 | 25 | 2 |

Table 6. 1982 salaries by years from degree, Ph.D.'s.

| Years from Degree | Median Salary | Mean Salary | Standard Deviation | Median Age | Total Number Known | No Response |
|---|---|---|---|---|---|---|
| | (in thousands of dollars) | | | | | |
| 0-4 | 30.0 | 29.1 | 9.6 | 31 | 560 | 10 |
| 5-9 | 35.0 | 34.8 | 10.1 | 36 | 658 | 21 |
| 10-14 | 38.9 | 39.3 | 11.8 | 40 | 799 | 20 |
| 15-19 | 41.2 | 42.0 | 12.5 | 45 | 602 | 22 |
| 20-24 | 44.8 | 46.2 | 13.4 | 51 | 387 | 10 |
| 25-29 | 47.0 | 47.7 | 13.7 | 55 | 298 | 16 |
| 30+ | 48.5 | 49.9 | 15.1 | 60 | 272 | 14 |

Table 7. 1982 industrial salary structure by years from degree, PhD's.

| Years from Degree | PERCENTILE SALARIES 10th | 25th | Median | 75th | 90th | Mean Salary | Standard Deviation | Median Age | Total Number Known |
|---|---|---|---|---|---|---|---|---|---|
| | (in thousands of dollars) | | | | | | | | |
| 0-4 | 31.2 | 34.0 | 36.7 | 40.0 | 43.5 | 37.4 | 6.1 | 31 | 193 |
| 5-9 | 33.0 | 36.5 | 41.5 | 45.0 | 50.4 | 42.1 | 9.1 | 36 | 223 |
| 10-14 | 37.3 | 42.0 | 48.0 | 55.0 | 61.0 | 49.6 | 11.5 | 40 | 212 |
| 15-19 | 39.4 | 46.1 | 52.0 | 60.0 | 70.0 | 53.9 | 12.7 | 45 | 124 |
| 20-24 | 39.2 | 45.0 | 54.1 | 64.3 | 76.6 | 56.7 | 17.2 | 51 | 77 |
| 25+ | 36.1 | 46.1 | 55.8 | 65.3 | 76.4 | 56.7 | 16.5 | 58 | 136 |

Table 8. 1982 government salary structure by years from degree, PhD's.

| Years from Degree | PERCENTILE SALARIES 10th | 25th | Median | 75th | 90th | Mean Salary | Standard Deviation | Median Age | Total Number Known |
|---|---|---|---|---|---|---|---|---|---|
| | (in thousands of dollars) | | | | | | | | |
| 0-4 | 23.8 | 29.7 | 32.0 | 38.8 | 50.1 | 34.6 | 9.3 | 34 | 33 |
| 5-9 | 30.1 | 33.5 | 35.8 | 39.5 | 45.1 | 36.5 | 5.6 | 36 | 66 |
| 10-14 | 34.7 | 37.4 | 41.0 | 45.6 | 51.3 | 41.8 | 6.3 | 41 | 95 |
| 15-19 | 38.0 | 42.0 | 48.0 | 52.6 | 57.5 | 47.4 | 6.8 | 46 | 64 |
| 20-24 | 43.0 | 49.3 | 54.5 | 57.5 | 58.5 | 52.5 | 6.2 | 52 | 42 |
| 25+ | 43.4 | 54.0 | 57.5 | 58.5 | 58.5 | 54.8 | 5.9 | 58 | 57 |

observed in any other area. Basically, this is due to three factors: the structure of civil service grades, built in cost of living increments, and the federal salary ceiling. The experience curve for National Laboratory salaries is the flattest of all sectors. Although salaries for recent Ph.D's are almost the same as those observed in industry, salaries for the more experienced scientists are considerably lower.

While variation in salaries between economic sectors is marked for most experience levels, there is also con-

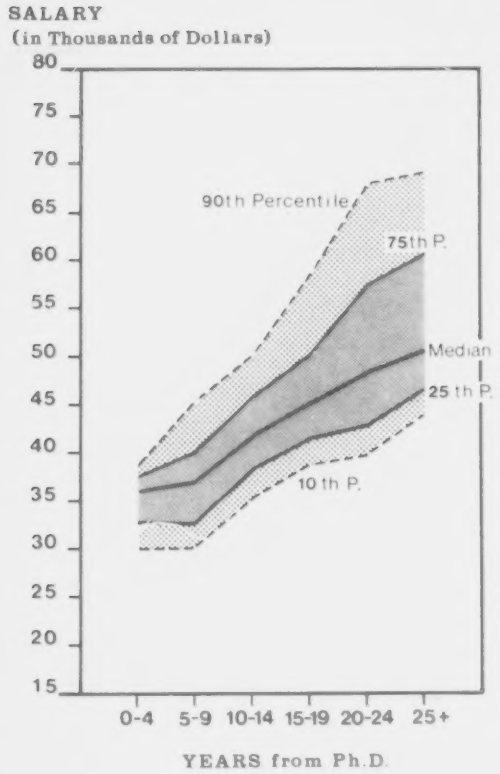


FIGURE 6. Salary structure in the National Laboratories by years from PhD, 1982.

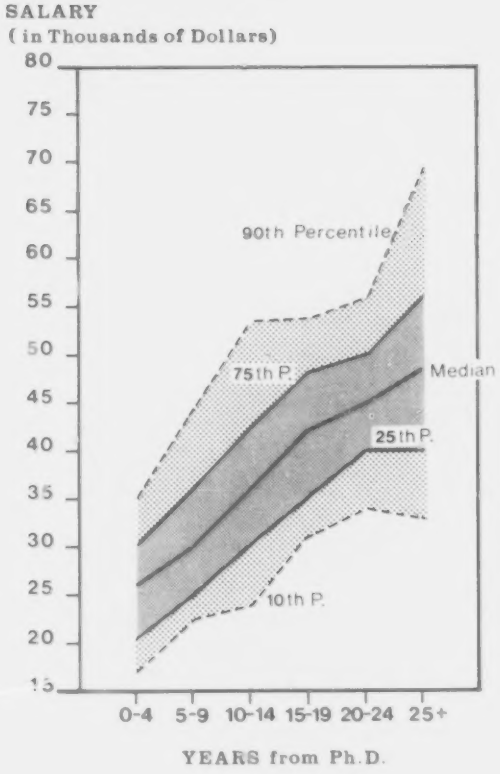


FIGURE 7. Salary structure in universities for 11-12 month salary base, by years from PhD, 1982.

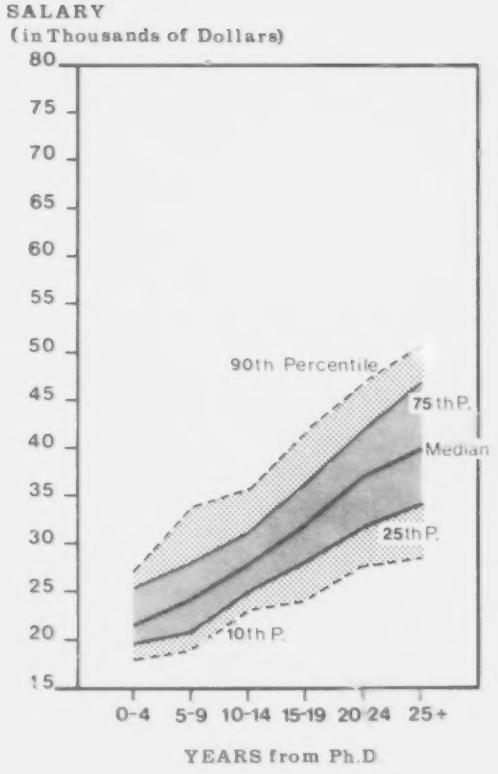


FIGURE 8. Salary structure in universities for 9-10 month salary base, by years from PhD, 1982.

siderable variation within a given employment sector as illustrated in Figures 4 through 8. The interquartile ranges [darkly shaded, central portions of each figure] represent the typical salary range for each experience level. The interdecile ranges [outlined by the lightly shaded, outer areas] give a picture of salary extremes which were observed. (1)

Salary variation is clearly greatest in industrial employment, a variability which increases with years of experience. Part of this variation is due to the diversity of career paths available in industry from bench scientist to corporate administrator, and part to the many different types of companies that employ society members. The very high salaries noted in the upper right hand corner of the industrial figure reflect the salaries of individuals who have moved into general administration or who have become heads of their own companies. In direct contrast to the salary structure in industry is

(1) See technical notes for explanation of quantile ranges.

Table 9. 1982 FFR&DC salary structure by years from degree, PhD's.

| Years from Degree | PERCENTILE SALARIES (in thousands of dollars) 10th | 25th | Median | 75th | 90th | Mean Salary | Standard Deviation | Median Age | Total Number Known |
|---|---|---|---|---|---|---|---|---|---|
| 0-4 | 30.0 | 32.6 | 36.0 | 37.5 | 38.7 | 35.5 | 4.7 | 31 | 40 |
| 5-9 | 30.2 | 32.6 | 37.0 | 40.0 | 45.2 | 36.9 | 5.9 | 35 | 73 |
| 10-14 | 35.4 | 38.3 | 41.8 | 45.8 | 50.2 | 42.4 | 6.3 | 40 | 104 |
| 15-19 | 38.7 | 41.4 | 45.0 | 50.0 | 58.2 | 47.1 | 8.9 | 45 | 77 |
| 20-24 | 39.8 | 42.8 | 48.4 | 57.5 | 68.0 | 51.1 | 11.5 | 50 | 54 |
| 25+ | 43.6 | 46.4 | 50.5 | 60.5 | 69.9 | 54.4 | 13.2 | 58 | 55 |

Table 10. 1982 university 11-12 month salary structure by years from degree, PhD's.

| Years from Degree | PERCENTILE SALARIES (in thousands of dollars) 10th | 25th | Median | 75th | 90th | Mean Salary | Standard Deviation | Median Age | Total Number Known |
|---|---|---|---|---|---|---|---|---|---|
| 0-4 (a) | 17.0 | 20.3 | 26.0 | 30.2 | 35.0 | 26.1 | 6.8 | 32 | 54 |
| 5-9 | 22.5 | 25.0 | 30.2 | 36.2 | 44.0 | 31.9 | 7.7 | 35 | 104 |
| 10-14 | 24.0 | 30.3 | 36.0 | 42.5 | 53.4 | 37.7 | 10.6 | 40 | 101 |
| 15-19 | 31.0 | 35.0 | 42.0 | 48.0 | 53.6 | 42.2 | 10.0 | 45 | 88 |
| 20-24 | 34.5 | 40.0 | 45.0 | 50.0 | 55.8 | 46.1 | 9.8 | 50 | 47 |
| 25+ | 33.0 | 40.0 | 48.4 | 55.8 | 69.4 | 49.8 | 13.4 | 58 | 88 |

(a) In addition there are 82 postdocs in the 0-4 years from degree group with known salaries working in universities on an 11-12 month salary base. Their median salary is $18,000.

Table 11. 1982 university 9-10 month salary structure by years from degree, PhD's. (a)

| Years from Degree | PERCENTILE SALARIES (in thousands of dollars) 10th | 25th | Median | 75th | 90th | Mean Salary | Standard Deviation | Median Age | Total Number Known |
|---|---|---|---|---|---|---|---|---|---|
| 0-4 | 18.0 | 19.8 | 21.6 | 25.5 | 27.1 | 22.6 | 4.9 | 33 | 54 |
| 5-9 | 19.0 | 21.0 | 24.3 | 28.1 | 34.0 | 25.3 | 5.8 | 35 | 92 |
| 10-14 | 23.1 | 25.0 | 28.0 | 31.3 | 35.9 | 28.8 | 5.6 | 41 | 161 |
| 15-19 | 24.3 | 28.1 | 32.2 | 36.5 | 42.0 | 32.8 | 6.5 | 45 | 192 |
| 20-24 | 27.7 | 31.7 | 37.0 | 42.1 | 47.0 | 37.3 | 7.5 | 50 | 132 |
| 25+ | 28.7 | 34.2 | 40.0 | 47.0 | 52.1 | 40.8 | 8.8 | 58 | 194 |

(a) Postdocs excluded

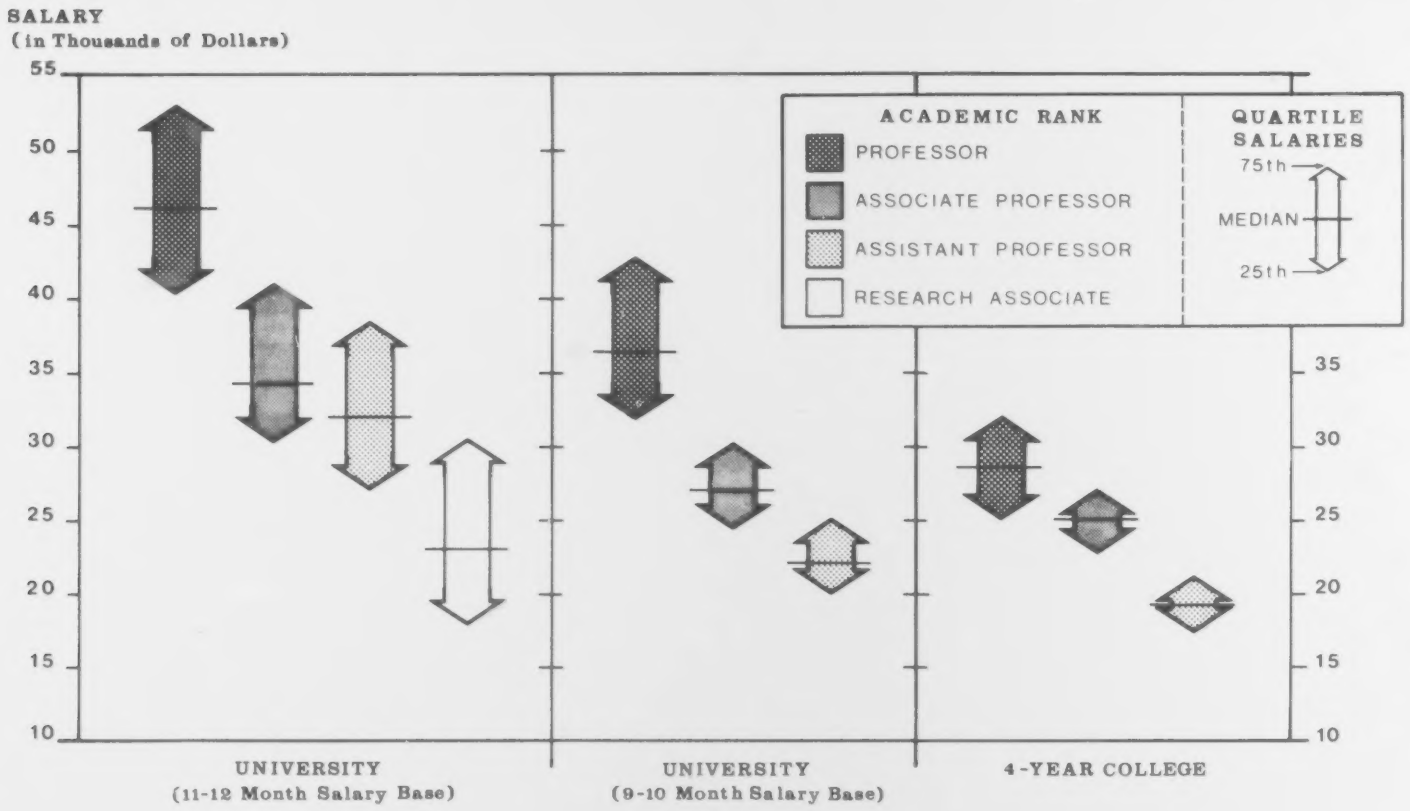


FIGURE 9. University and 4-year college salaries for PhD's by academic rank, 1982.

that observed in government. The typical salary range, generally quite narrow at all experience levels, tightens at the most advanced points reflecting the dominance of federal salary ceilings. The ceiling is higher than it was last year, but its effect on the salary structure is clearly evident.

The salary structure at the National Laboratories falls between that observed in industry and the one observed in government. Although there is a fairly narrow range in starting salaries, it may be noted that for individuals with 20 or more years of experience there is considerable variation among salaries above the median.

In the universities, the typical salary range remains fairly narrow at each level of experience. This is particularly true for staff members working on a 9-10 month salary base, who represent nearly two-thirds of the university respondents. Their salary range expands slowly, at a relatively regular rate, probably reflecting the traditional structure of academic ranks. More extreme

Table 12. 1982 university salaries by selected academic rank and salary base, PhD's.

| | QUARTILE SALARIES 25th | Median | 75th | Mean | Standard Deviation | Median Age | Total Number Known | No Response |
|---|---|---|---|---|---|---|---|---|
| | (in thousands of dollars) | | | | | | | |
| Professor | | | | | | | | |
| 9-10 Month Salary | 31.4 | 36.2 | 42.6 | 37.5 | 7.9 | 50 | 515 | 8 |
| 11-12 Month Salary | 40.0 | 46.0 | 53.0 | 46.9 | 10.6 | 50 | 173 | 7 |
| Associate Professor | | | | | | | | |
| 9-10 Month Salary | 24.4 | 27.0 | 30.2 | 27.4 | 4.2 | 42 | 152 | 2 |
| 11-12 Month Salary | 30.0 | 34.0 | 41.0 | 35.8 | 7.9 | 43 | 51 | 2 |
| Assistant Professor | | | | | | | | |
| 9-10 Month Salary | 20.0 | 22.0 | 25.0 | 22.7 | 3.9 | 34 | 92 | - |
| 11-12 Month Salary | 27.0 | 32.0 | 38.4 | 34.8 | 11.6 | 35 | 46 | - |
| Research Associate | | | | | | | | |
| 11-12 Month Salary | 18.0 | 23.0 | 30.5 | 24.5 | 8.0 | 34 | 156 | 2 |

Table 13. 1982 4-year college salaries by selected academic rank on 9-10 month salary, PhD's.

| | QUARTILE SALARIES 25th | Median | 75th | Mean | Standard Deviation | Median Age | Total Number Known | No Response |
|---|---|---|---|---|---|---|---|---|
| | (in thousands of dollars) | | | | | | | |
| Professor | 25.0 | 28.5 | 32.0 | 28.3 | 5.4 | 47 | 57 | 1 |
| Associate Professor | 22.5 | 25.0 | 28.0 | 25.5 | 4.2 | 42 | 37 | 1 |
| Assistant Professor | 17.8 | 19.1 | 21.0 | 19.5 | 2.7 | 35 | 24 | - |

variability can be noted in university 11-12 month salaries, reflecting the diverse group of administrators, non-faculty university staff, and faculty on year-round federal grants.

## Salaries and Academic Rank

The salaries received by society members employed in universities appear to be substantially higher than the national average for all university employed faculty.(1) However, this high overall salary is actually an artifact of the disproportionate number of society members who are full professors, the highest paid academic rank. Two-thirds of those holding professorial ranks are at the full professor level and only 13% are assistant professors. By comparison, fewer than half of the PhD's holding professorial ranks in all university science and engineering departments are full professors; 23% are assistant professors. The proportion of young physics faculty is well below national averages for science and engineering departments; it is also below the level that department chairmen feel is critical to maintaining a healthy and vibrant basic research program (22-30%).(2) This low level of opportunity in academe for young physics PhD's has raised considerable concern regarding the aging of the academic community and the concomitant effect on both the quality of higher education and the vitality of the basic research which has traditionally been conducted in the university sector.

(1) NCES, unpublished data on 1982 faculty salaries.

(2) Young & Senior Science and Engineering Faculty, 1980. National Science Foundation Special Report.

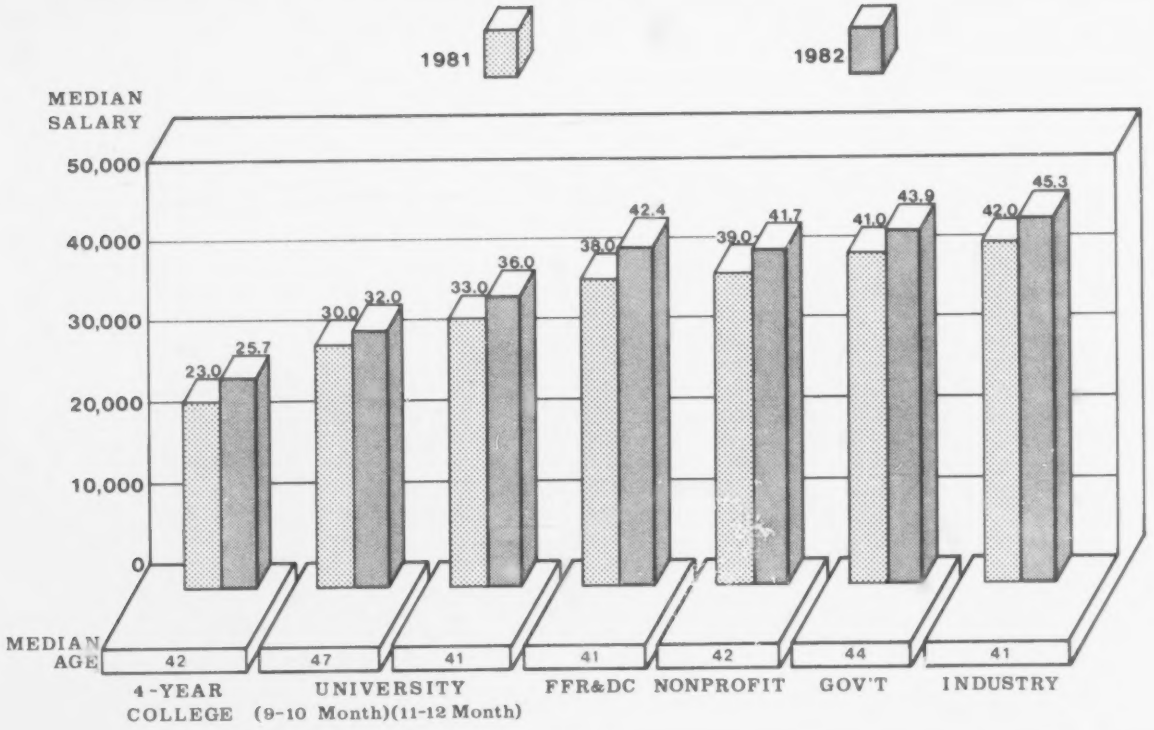


FIGURE 10. 1981 and 1982 median salaries by employer type for PhD's remaining with the same employer.

When examined by type of institution, academic rank and salary base, salaries earned by society members in universities and 4-year colleges are only marginally higher than the national average for all faculty. There are two exceptions. Full professors in 4-year colleges earn considerably less than the national average, while assistant professors in universities on an 11-12 month base earn considerably more than the national average. The latter also earn substantially more (45%) than assistant professors on a 9-10 month salary base.

As illustrated in Figure 9, the variability of typical salaries (indicated by interquartile ranges) differs markedly by type of institution and rank. Within universities, individuals working on an 11-12 month salary base have a typical salary range at each rank in exess of $10,000. This large variation is, in part, due to the inclusion of research grant-based salaries in this sector. The research associate is the epitome of this phenomenon. This position includes both low-paid postdocs and a new, emerging rank often referred to as research scientist. The latter are usually paid considerably more than postdocs. By contrast, salaries in 4-year colleges are not likely to be grant-based and have a very compressed range. The range of typical salaries at the assistant professor level in 4-year colleges is especially narrow, barely exceeding $3,000.

Table 14. 1981 and 1982 salaries for members continuing employment by selected employer type, PhD's. (a)

| | Salary Year | Median Salary | Mean Salary | Standard Deviation | Median Age | Total Number Known |
|---|---|---|---|---|---|---|
| | | (in thousands of dollars) | | | | |
| UNIVERSITY | | | | | | |
| (9-10 month salary base) | 1981 | 30.0 | 31.4 | 8.4 | | |
| | 1982 | 32.0 | 33.4 | 8.6 | 47 | 587 |
| (11-12 month salary base) | 1981 | 33.0 | 34.2 | 12.1 | | |
| | 1982 | 36.0 | 37.1 | 13.0 | 41 | 351 |
| 4-YEAR COLLEGE | | | | | | |
| (9-10 month salary base) | 1981 | 23.0 | 24.0 | 5.9 | | |
| | 1982 | 25.7 | 25.5 | 5.7 | 42 | 106 |
| INDUSTRY | 1981 | 42.0 | 44.8 | 13.3 | | |
| | 1982 | 45.3 | 48.5 | 13.3 | 41 | 672 |
| GOVERNMENT | 1981 | 41.0 | 40.9 | 7.9 | | |
| | 1982 | 43.9 | 45.0 | 9.1 | 44 | 286 |
| FFR&DC | 1981 | 38.0 | 38.9 | 8.9 | | |
| | 1982 | 42.4 | 43.1 | 9.6 | 41 | 326 |
| NONPROFIT | 1981 | 39.0 | 41.1 | 13.5 | | |
| | 1982 | 41.7 | 43.6 | 12.9 | 42 | 71 |

(a) Data based on society members who responded in both 1981 and 1982, were full-time employed, and did not change employers in the years 1981-82.

## Salary Increases and Employer Type

While we have made some comparisons between 1981 and 1982 median salaries in the previous discussion, actual salary increases are more accurately reflected by examining the data from our longitudinal sample, where the same individuals provided us with their salaries in both 1981 and in 1982.

Figure 10 portrays the increases in median salaries for PhD's who remained with the same employer. These increases were all at, or above, the rate of inflation during that period. In most employment areas, it can be noted that salaries increased by $2,000 to $3,000 over the 1981 levels. This represented a 7 to 9% increase in universities, industry and government, and a somewhat higher percentage increase in four-year colleges where the salaries, despite the increase, remain the lowest of all PhD salaries. Individuals remaining at the National Laboratories received the largest absolute salary increases, $4,400, which also represented a substantial percentage increase, over 11%.

Salary increases, as one might expect, were not the same for each experience level. Analysis indicates that in most areas of employment the highest percentage increases occurred in the first ten years after the PhD

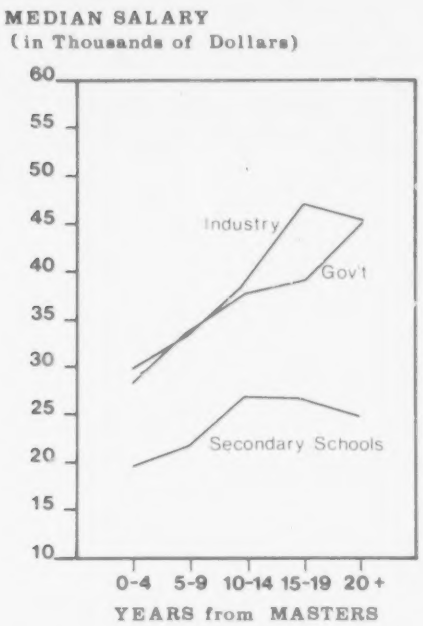


FIGURE 11. Median salaries in industry, government and secondary schools by years from Master's degree, 1982.

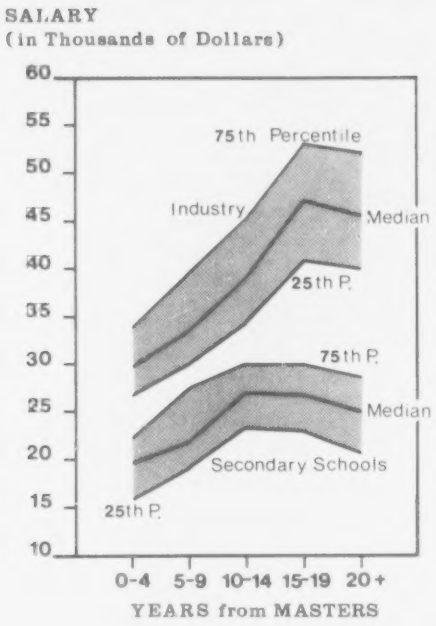


FIGURE 12. Salary structures in industry and secondary schools by years from Master's degree, 1982.

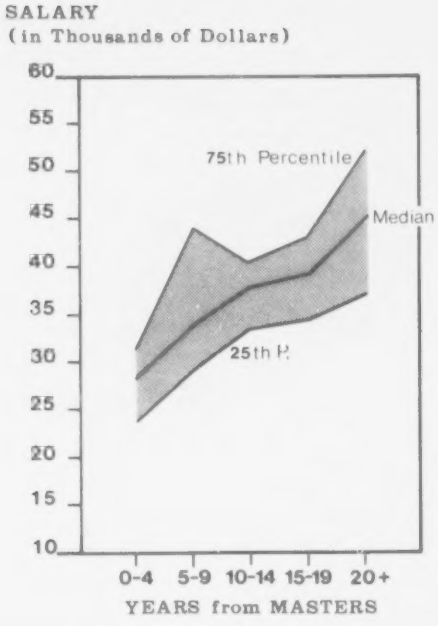


FIGURE 13. Salary structure in government by years from Master's degree, 1982.

with some salary compression for the more experienced scientists.

The above discussion dealt with salary raises for PhD's who remained with the same employer during the past year. Society members also change employers. While the absolute number of individuals making such employment changes in a given year is too small for extensive analysis, some general points can be made. They are about six years younger than those individuals who remain with the same employer (median age 37 in contrast to 43), and their salary gains are greater, both in percentage and absolute terms. Next year when employment and salary change will be examined over a two-year period, more detailed analysis will be available.

## SALARIES AND EMPLOYER TYPE FOR MASTER'S AND BACHELOR'S

Much of the previous discussion has focused on PhD's since they form the major component of the full-time employed society membership. Most of the lower degree holders among the society membership are advanced graduate students, who are not included in typical salary analysis. Even though they don't represent a high proportion of the total membership, there is a substantial number of non-student Master's and, to a lesser extent, Bachelor's degree holders who are members of several of the AIP member societies. Many of them are teachers, engineers, skilled technicians, and administrators. The following presents some salary data on these groups. It

Table 15. 1982 salaries by selected employer type, Master's.

| | Median Salary | Mean Salary | Standard Deviation | Median Age | Total Number Known | No Response |
|---|---|---|---|---|---|---|
| | (in thousands of dollars) | | | | | |
| Junior College | 26.0 | 26.5 | 6.4 | 45 | 52 | 3 |
| Secondary School | 25.5 | 24.8 | 5.9 | 44 | 136 | 3 |
| Industry/Self-Employed | 39.6 | 41.6 | 15.5 | 42 | 357 | 24 |
| Government | 37.0 | 38.4 | 9.6 | 44 | 109 | 2 |
| FFR&DC | 37.8 | 40.0 | 9.1 | 39 | 31 | 2 |
| Nonprofit | 37.4 | 37.7 | 6.6 | 38 | 36 | 1 |

Table 16. 1982 salaries by selected type of employer and years from degree, Master's.

| | Years from Degree | QUARTILE SALARIES 25th | Median | 75th | Mean | Standard Deviation | Median Age | Total Number Known | No Response |
|---|---|---|---|---|---|---|---|---|---|
| | | (in thousands of dollars) | | | | | | | |
| Secondary School | 0-4 | 16.0 | 19.8 | 22.3 | 20.3 | 5.2 | 36 | 18 | 1 |
| | 5-9 | 19.2 | 22.0 | 27.5 | 23.2 | 4.9 | 39 | 21 | 1 |
| | 10-14 | 23.2 | 27.0 | 30.0 | 26.4 | 4.4 | 41 | 49 | - |
| | 15-19 | 23.0 | 26.8 | 30.0 | 26.6 | 5.0 | 49 | 22 | - |
| | 20+ | 20.6 | 25.0 | 28.6 | 24.7 | 8.4 | 55 | 25 | 1 |
| Industry | 0-4 | 26.6 | 29.7 | 33.9 | 30.5 | 6.2 | 30 | 64 | 6 |
| | 5-9 | 30.0 | 33.5 | 39.4 | 35.7 | 10.6 | 32 | 71 | 6 |
| | 10-14 | 34.2 | 39.0 | 45.0 | 42.6 | 15.0 | 39 | 55 | 3 |
| | 15-19 | 40.8 | 47.1 | 53.0 | 47.2 | 11.0 | 45 | 45 | 2 |
| | 20+ | 40.0 | 45.5 | 52.0 | 48.9 | 18.5 | 56 | 114 | 7 |
| Government | 0-4 | 23.6 | 28.2 | 31.1 | 27.2 | 5.6 | 31 | 16 | - |
| | 5-9 | 29.0 | 33.6 | 43.6 | 35.6 | 10.1 | 36 | 16 | 1 |
| | 10-14 | 33.3 | 37.6 | 40.3 | 37.0 | 5.0 | 39 | 18 | - |
| | 15-19 | 34.4 | 39.0 | 43.0 | 39.7 | 6.6 | 45 | 22 | - |
| | 20+ | 37.0 | 45.0 | 52.0 | 45.1 | 9.6 | 57 | 34 | 1 |

should, however, be noted that while this material does reflect the salaries of lower degree holders among the society membership, it is not likely to reflect the salaries of all Bachelor's and Master's degree holders in physics and physics related fields. We are dealing here with an atypical group, a small proportion of the total Master's and Bachelor's produced in these fields over the years: those who consider it important to assume and maintain society membership.

With the above caveat in mind, let us look first at the salary structure among Master's degree holders.

They are employed primarily in industry, secondary schools and government with more than half of the latter group employed by the military. Much smaller numbers of Master's are found in nonprofit organizations and the National Laboratories. As might be expected, the highest salaries are in industry and the lowest are in secondary schools. Figure 11 illustrates the variation in median salary by years of experience since the Master's degree was received for society members working in each of the

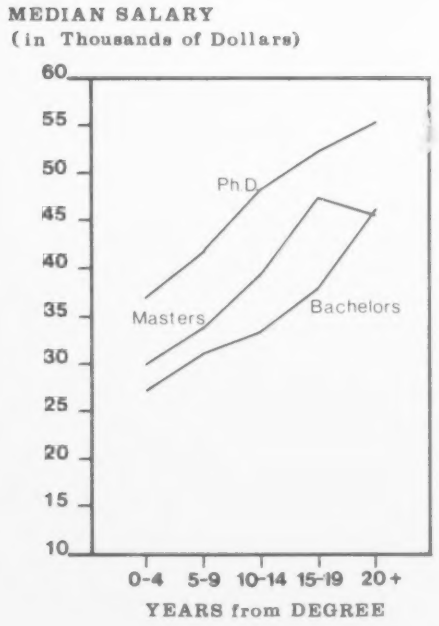


FIGURE 14. Median salaries by degree level and years from degree for industrially employed society members, 1982.

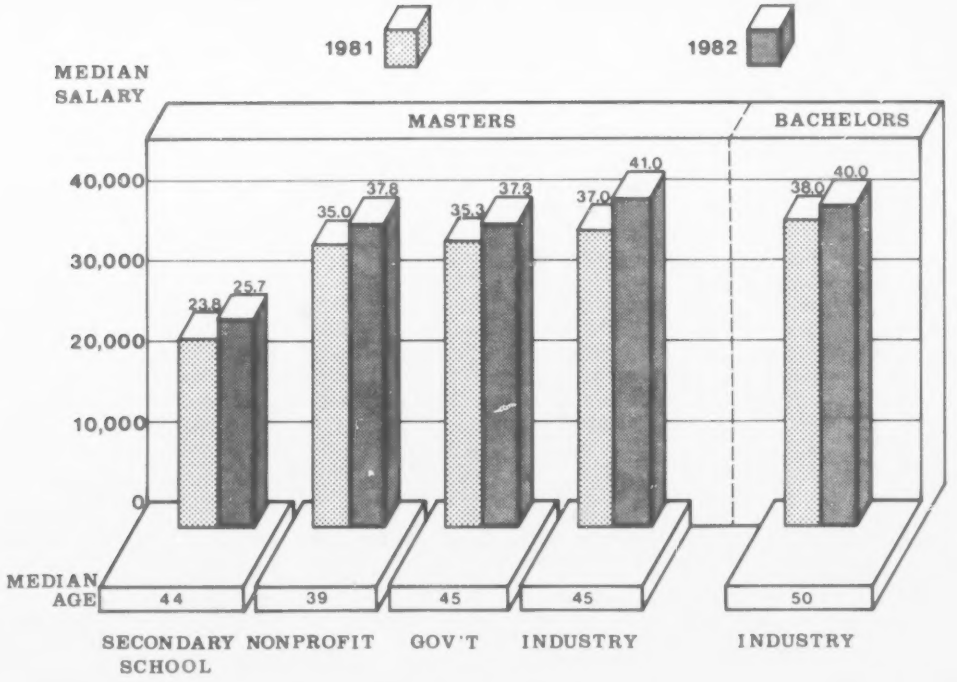


FIGURE 15. 1981 and 1982 salaries for Master's and Bachelor's degree holders remaining with the same employer by selected employer types.

three major employer areas. Secondary school salaries not only start out low, but they continue low over the distribution; in fact, there was a difference in median salary of only slightly more than $5,000 between those who had less than five years experience teaching and those who had 20 or more years of experience. Industrial and government salaries, considerably higher at all levels than secondary school salaries, are quite similar to each other for the first 15 years after the Master's degree. Industrial salaries at the more experienced levels accelerate somewhat faster than governmental salaries. In general, median salaries appear to be about $2,000 to $3,000 higher than those observed last year.

Some salary variation also exists at each level of experience. Although the number of Master's degree holders in our sample is not large enough to present the full detail that was possible for the PhD's, Figures 12 and 13 illustrate the typical salary variation at each experience level for Master's degree holders employed in secondary schools, industry and government. Figure 12 underlines one of the factors contributing to the problems facing secondary school science education in this country today. At every level of experience, secondary school teachers are making less then the bottom quarter of those working in industry. The slope of the salary curves for Master's degree holders in industry is quite

Table 17. 1982 industrial salaries by years from degree, Bachelor's.

| Years from Degree | Median Salary | Mean Salary | Standard Deviation | Median Age | Total Number Known | No Response |
|---|---|---|---|---|---|---|
| | (in thousands of dollars) | | | | | |
| 0-4 | 26.7 | 27.1 | 6.0 | 26 | 35 | 2 |
| 5-9 | 29.5 | 31.0 | 7.5 | 29 | 31 | 2 |
| 10-14 | 35.0 | 33.2 | 10.5 | 36 | 36 | 3 |
| 15-19 | 36.4 | 37.8 | 7.7 | .42 | 24 | 3 |
| 20-24 | 44.4 | 45.8 | 20.3 | 47 | 40 | 1 |
| 25+ | 48.0 | 50.0 | 20.6 | 57 | 101 | 13 |

Table 18. 1981 and 1982 salaries for members continuing employment by selected employer type, Master's and Bachelor's.

| | Year Salary | Median Salary | Mean Salary | Standard Deviation | Median Age | Total Number Known |
|---|---|---|---|---|---|---|
| | | (in thousands of dollars) | | | | |
| MASTER'S | | | | | | |
| Secondary School | 1981 | 23.8 | 23.5 | 5.8 | | |
| | 1982 | 25.7 | 24.9 | 6.0 | 44 | 108 |
| Industry | 1981 | 37.0 | 40.0 | 14.8 | | |
| | 1982 | 41.0 | 43.3 | 17.3 | 45 | 219 |
| Government | 1981 | 35.3 | 36.8 | 8.1 | | |
| | 1982 | 37.8 | 40.0 | 9.3 | 45 | 75 |
| Nonprofit | 1981 | 35.0 | 34.1 | 5.3 | | |
| | 1982 | 37.8 | 37.7 | 5.6 | 39 | 21 |
| BACHELOR'S | | | | | | |
| Industry | 1981 | 38.0 | 40.0 | 21.6 | | |
| | 1982 | 40.0 | 42.0 | 20.6 | 50 | 150 |

steep. However, the variation in salary, particularly at the more experienced levels, is not nearly as marked as that observed among PhD's employed in industry.

Industry is the only employment sphere in which there are a sufficient number of members in our sample to compare the salaries of PhD's, Master's and Bachelor's at each experience level. Overall comparisons can be misleading since society members with Bachelor's are much older than those with graduate degrees. As Figure 14 indicates, except for the most advanced levels of experience, there are differences of several thousand dollars between the salaries of Master's and Bachelor's degree holders and ten to fifteen thousand dollar differences between the salaries of Bachelor's and PhD's at each level of experience.

In order to examine patterns of salary increase, we need to turn to our longitudinal sample. Figure 15 and Table 18 look at Master's and Bachelor's degree holders among the membership who remained with the same employer in 1981 and 1982. The largest absolute and percentage increases can be observed for Master's employed in industry where the median salary rose from $37,000 to $41,000

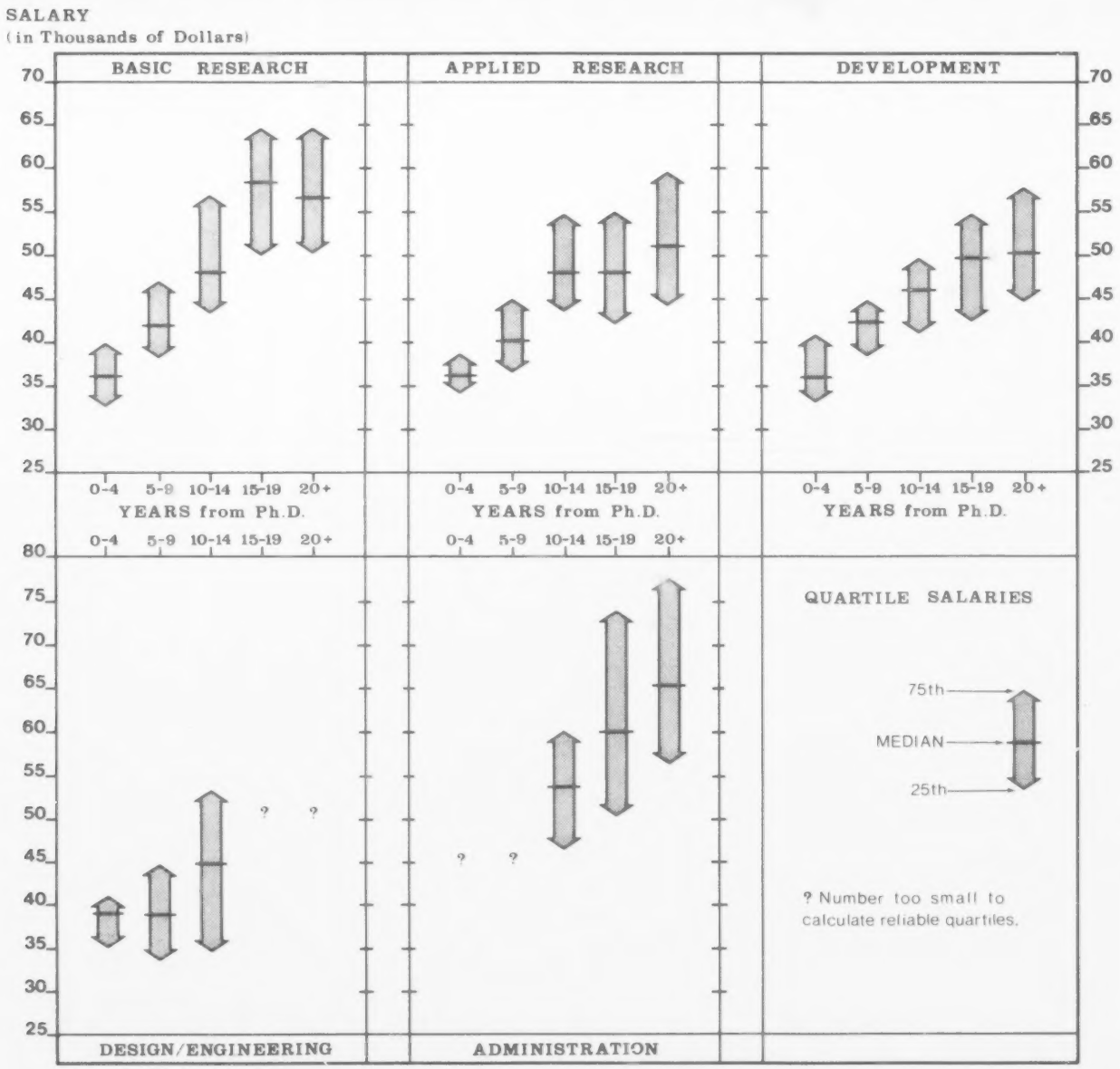


FIGURE 16. Industrial salaries by primary work activity and years from PhD, 1982.

Table 19. 1982 industrial salaries by primary work activity and years from degree, PhD's.

| Work Activity Years from Degree | QUARTILE SALARIES 25th | Median | 75th | Mean | Standard Deviation | Median Age | Total Number Known | No Response |
|---|---|---|---|---|---|---|---|---|
| | (in thousands of dollars) | | | | | | | |
| Basic Research | | | | | | | | |
| 0-4 | 32.4 | 36.0 | 39.9 | 36.2 | 5.0 | 30 | 32 | 2 |
| 5-9 | 38.0 | 41.8 | 47.0 | 44.5 | 9.7 | 35 | 29 | 2 |
| 10-14 | 43.1 | 48.0 | 57.0 | 49.5 | 9.3 | 39 | 26 | 1 |
| 15-19 | 49.7 | 58.3 | 64.0 | 55.8 | 9.8 | 45 | 15 | 2 |
| 20+ | 50.0 | 56.5 | 64.6 | 57.6 | 11.9 | 55 | 22 | - |
| Applied Research | | | | | | | | |
| 0-4 | 34.0 | 36.0 | 38.5 | 36.4 | 3.6 | 31 | 95 | - |
| 5-9 | 36.2 | 40.0 | 44.9 | 40.9 | 5.9 | 36 | 102 | 3 |
| 10-14 | 43.3 | 48.0 | 54.8 | 49.4 | 9.2 | 41 | 81 | 1 |
| 15-19 | 41.6 | 48.0 | 55.0 | 49.1 | 9.3 | 45 | 40 | 1 |
| 20+ | 44.0 | 51.0 | 59.5 | 51.8 | 10.5 | 53 | 80 | 4 |
| Development | | | | | | | | |
| 0-4 | 33.0 | 36.0 | 40.8 | 36.7 | 6.2 | 32 | 33 | - |
| 5-9 | 38.4 | 42.2 | 44.8 | 42.1 | 6.2 | 36 | 38 | 2 |
| 10-14 | 40.8 | 46.0 | 55.0 | 48.8 | 14.2 | 41 | 43 | 1 |
| 15-19 | 42.3 | 49.8 | 55.0 | 49.1 | 8.2 | 48 | 12 | 1 |
| 20+ | 44.5 | 50.2 | 57.8 | 52.1 | 13.1 | 56 | 29 | - |
| Design/Engineering | | | | | | | | |
| 0-4 | 34.9 | 39.0 | 41.0 | 39.7 | 9.0 | 32 | 28 | - |
| 5-9 | 33.3 | 38.9 | 44.8 | 39.6 | 8.9 | 35 | 32 | - |
| 10-14 | 34.3 | 44.7 | 53.2 | 44.7 | 13.2 | 40 | 19 | - |
| 15-19 | | * | | | | | | |
| 20+ | | * | | | | | | |
| Administration | | | | | | | | |
| 0-4 | | * | | | | | | |
| 5-9 | | * | | | | | | |
| 10-14 | 46.3 | 53.5 | 60.0 | 55.7 | 12.8 | 40 | 30 | 4 |
| 15-19 | 50.0 | 60.0 | 74.0 | 63.4 | 14.8 | 45 | 32 | 1 |
| 20+ | 56.0 | 65.2 | 77.6 | 69.2 | 21.1 | 55 | 56 | 4 |

* Number too small to calculate reliable quartiles.

over the one year period. Increases in government and secondary schools were lower, although still above the inflation rate. The lowest percentage increase was found among the Bachelor's in industry, a relatively older group. This may reflect a salary compression at the more experienced levels similar to the one noted among PhD's.

## SALARIES AND PRIMARY WORK ACTIVITY

While variation in salaries is most strongly influenced by type of employer and extent of professional experience, the kind of work individuals do also affects their salary levels. PhD's are engaged in the widest

Table 20. 1981 and 1982 salaries for members continuing in the same principal work activity, PhD's.

| | Salary Year | Median Salary | Mean Salary | Standard Deviation | Median Age | Total Number Known |
|---|---|---|---|---|---|---|
| | | (in thousands of dollars) | | | | |
| Teaching | 1981 | 28.6 | 29.7 | 8.5 | | |
| | 1982 | 30.1 | 31.3 | 8.7 | 46 | 640 |
| Basic Research | 1981 | 33.8 | 34.3 | 11.6 | | |
| | 1982 | 36.6 | 37.3 | 12.3 | 40 | 802 |
| Applied Research | 1981 | 38.2 | 39.4 | 9.2 | | |
| | 1982 | 42.0 | 43.1 | 9.6 | 40 | 594 |
| Development | 1981 | 40.6 | 41.2 | 9.2 | | |
| | 1982 | 43.8 | 45.1 | 11.1 | 41 | 147 |
| Design/Engineering | 1981 | 37.6 | 39.0 | 9.5 | | |
| | 1982 | 42.4 | 43.4 | 10.8 | 39 | 91 |
| Administration | 1981 | 49.2 | 50.1 | 15.4 | | |
| | 1982 | 52.0 | 53.9 | 15.2 | 48 | 312 |

Table 21. 1981 and 1982 salaries for members continuing in the same principal work activity, Master's.

| | Salary Year | Median Salary | Mean Salary | Standard Deviation | Median Age | Total Number Known |
|---|---|---|---|---|---|---|
| | | (in thousands of dollars) | | | | |
| Teaching | 1981 | 24.0 | 24.0 | 5.6 | | |
| | 1982 | 26.0 | 25.6 | 6.0 | 46 | 176 |
| Applied Research | 1981 | 35.8 | 36.8 | 10.5 | | |
| | 1982 | 39.0 | 39.8 | 11.6 | 46 | 91 |
| Development | 1981 | 35.0 | 35.9 | 9.6 | | |
| | 1982 | 38.0 | 38.7 | 9.3 | 42 | 71 |
| Design/Engineering | 1981 | 34.6 | 35.9 | 10.0 | | |
| | 1982 | 36.9 | 39.3 | 11.0 | 42 | 70 |
| Administration | 1981 | 45.0 | 46.1 | 18.7 | | |
| | 1982 | 46.0 | 50.5 | 23.6 | 48 | 65 |

diversity of work activities. Those who remained in teaching or in administration were the oldest and had the lowest percentage salary increases between 1981 and 1982. Administrators, however, still have the highest salary levels and teachers, the lowest.

Salary increases for society members who continued to work in research and development were somewhat above inflation, with increases in the 8 to 10% range. PhD's working in design and engineering received both the highest percentage increments (nearly 13%) and the largest

Table 22. 1981 and 1982 salaries for members continuing in the same principal work activity, Bachelor's.

| | Salary Year | Median Salary | Mean Salary | Standard Deviation | Median Age | Total Number Known |
|---|---|---|---|---|---|---|
| | | (in thousands of dollars) | | | | |
| Teaching | 1981 | 20.0 | 19.8 | 4.8 | | |
| | 1982 | 22.8 | 21.9 | 4.9 | 37 | 22 |
| Applied Research | 1981 | 40.0 | 37.5 | 10.3 | | |
| | 1982 | 42.0 | 39.9 | 11.5 | 48 | 44 |
| Development | 1981 | 36.0 | 38.3 | 18.2 | | |
| | 1982 | 40.0 | 42.6 | 20.6 | 52 | 42 |
| Design/Engineering | 1981 | 32.0 | 33.6 | 10.0 | | |
| | 1982 | 35.0 | 36.1 | 10.9 | 46 | 53 |
| Administration | 1981 | 40.0 | 50.2 | 32.4 | | |
| | 1982 | 43.0 | 49.7 | 29.0 | 53 | 44 |

absolute dollar increases. This pattern of major salary changes, combined with the comparatively young median age of these PhD's, may reflect a heightened demand for individuals on the design and engineering area.

There are sufficient numbers of PhD's engaged in a variety of work activities within private industry to afford a detailed examination of salary structures in that sector. In fact, most applied research, development, design and engineering is conducted in industry. By comparison, basic research, which is heavily university based, is conducted by relatively few industrially employed PhD's, only 10% of all involved in that work activity. As illustrated in Figure 16, the range of typical salaries generally increases with years of professional experience. This is indicative of both the wealth of career paths available within this sector and the variety of companies, from small hi-tech consulting firms to major corporations, that employ society members.

Entry-level salaries, reflected by the medians for PhD's who earned their degrees in the past 4 years, are remarkably similar in each of the three areas of basic research, applied research and development. Individuals working in design and engineering have higher entry-level salaries, added evidence for the probable high demand in this area. There were too few administrators with less than nine years of professional experience to report reliable salary information. This suggests that society members typically move into administration during mid-career or later. Individuals making this career change earn salaries considerably higher than their colleagues in other work activities, topping $65,000 for those with 20 or more years in the labor force. Within the other work activity areas, the few industrially employed PhD's working in basic research with 15 or more years of experience earn salaries higher than those in applied or development. There were too few PhD's in design and engineering at this experience level to report. This could indicate either that this is a recent area of demand for society members, or that individuals with experience in design and engineering are highly likely to move into other work activities later in their careers.

As noted earlier, caution should be taken when interpreting salary data for lower degree holders. The relatively small number of non-student Master's and Bachelor's who belong to AIP member societies may not be representative of all lower degree holders with physics and related science/engineering backgrounds. Certainly they do not represent the majority of young degree holders, many of whom move away from physics-related work soon after they earn these degrees.

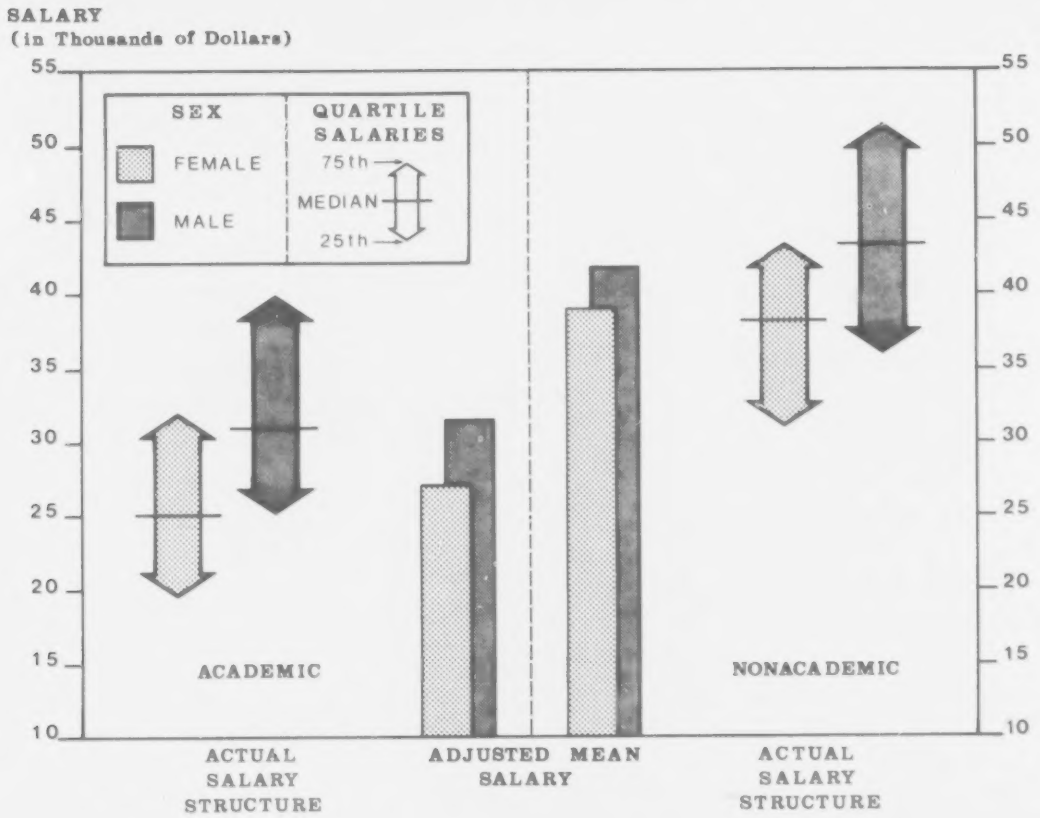


FIGURE 17. Academic and nonacademic salary structures for male and female society members, 1982. In addition to the actual interquartile ranges observed, mean salaries adjusted for age differences between males and females are presented.

A small but substantial number of Master's degree holders, however, do hold society membership and continue to identify with physics-related areas beyond their student days. Their salaries, although lower than their PhD colleagues, have basically kept pace with inflation, except for the older group in administrative positions.

Master's who had moved into administration drew the highest salaries despite the minimal increases during the past year. It should, however, be noted that their salaries are $6,000 less than those paid to their PhD colleagues of comparable age.

Master's degree holders involved in development, design and engineering areas indicated moderate salary increases between 1981 and 1982. Those involved in

Table 23. 1981 and 1982 salaries by sex and major employment sector. (a)

| | Salary Year | | Median Salary (in thousands of dollars) | Mean Salary | Standard Deviation | Median Age | Total Number Known |
|---|---|---|---|---|---|---|---|
| ACADEMIC | 1981 | Male | 29.4 | 31.0 | 10.4 | | |
| | | Female | 22.5 | 24.9 | 8.8 | | |
| | 1982 | Male | 31.0 | 32.9 | 10.8 | 45 | 1404 |
| | | Female | 25.0 | 26.6 | 8.7 | 42 | 92 |
| NONACADEMIC | 1981 | Male | 40.0 | 41.5 | 13.3 | | |
| | | Female | 35.0 | 35.4 | 8.8 | | |
| | 1982 | Male | 43.2 | 45.1 | 13.9 | 43 | 1861 |
| | | Female | 38.0 | 38.6 | 9.0 | 36 | 71 |

(a) Data based on members who responded in both 1981 and 1982, were full-time employed, and did not change employers.

teaching, predominantly in the secondary schools and junior colleges, again drew the lowest salaries, despite recent increases.

Further data analysis at the lower degree level proves difficult. The number of Bachelor's degree holders in the sample is generally too limited to comment on. Except for the small group involved in teaching, they have quite a bit more experience than either the PhD's or Master's, due both to their actual advanced age and the fact that Bachelor's enter the labor force earlier than those with higher degrees. This makes further comparisons between degree levels problematic.

## SALARIES AND EMPLOYER TYPE FOR MALES AND FEMALES

Both within and outside of academe, men receive higher salaries than their female colleagues. In fact, as Figure 17 illustrates, only the top 25% of the salaries received by women are comparable to the median salary received by men. This disparity in the salaries paid to men and women is the result of several factors including: age structure and subsequent professional experience levels, employment patterns, career paths and perhaps discrimination.

As reflected by the median ages in Table 23, women society members are younger than men. Women have been joining AIP member societies in increasing numbers. They now comprise approximately 10% of the youngest group of all full-time employed society members, those who earned their degrees in the past 4 years. In contrast, they make up less than 4% of all full-time employed members who earned their degree 10 or more years ago. Thus, women as a group have been in the job market for fewer years and have less professional experience than men. This is, in part, responsible for their lower salaries. It should be stressed that, although the rate of participation of women in physics and astronomy at the doctorate level has been increasing, this rate is, nevertheless, substantially lower than that for almost every other field of science.

Salary discrepancies are also due, in part, to changes in employment patterns. Women who are recent degree recipients are beginning to emulate the employment patterns of men. Academe in general and universities in particular were the dominant employers of PhD's, both men and women, prior to 1966. Women at all degree levels have traditionally been even more likely than men to be employed in academe. This employment pattern has been changing and now the majority of recent PhD's, both men and women, are employed in private industry.

Table 24. 1982 industrial salaries by sex.

| | Median Salary (in thousands of dollars) | Mean Salary | Standard Deviation | Median Age | Total Number Known | No Response |
|---|---|---|---|---|---|---|
| OVERALL | | | | | | |
| Male | 42.5 | 45.2 | 15.6 | 41 | 1569 | 90 |
| Female | 33.3 | 34.9 | 8.7 | 32 | 63 | 2 |
| YEARS FROM DEGREE | | | | | | |
| 0-4 | | | | | | |
| Male | 35.0 | 34.8 | 7.3 | 31 | 272 | 10 |
| Female | 30.9 | 32.2 | 6.1 | 29 | 28 | - |
| 5-9 | | | | | | |
| Male | 39.4 | 39.7 | 9.7 | 35 | 306 | 21 |
| Female | 34.6 | 34.2 | 6.8 | 34 | 19 | 1 |
| 10+ | | | | | | |
| Male | 48.0 | 50.0 | 16.5 | 49 | 955 | 58 |
| Female | 44.5 | 42.1 | 11.1 | 46 | 14 | 1 |

Table 25. 1982 university and 4-year college salaries by sex.

| | Median Salary (in thousands of dollars) | Mean Salary | Standard Deviation | Median Age | Total Number Known | No Response |
|---|---|---|---|---|---|---|
| FULL AND ASSOC. PROF. (9-10 Month Base) | | | | | | |
| Male | 32.0 | 33.5 | 8.4 | 48 | 791 | 13 |
| Female | 29.0 | 30.3 | 7.6 | 43 | 26 | - |
| OTHER RANKS (a) (9-10 Month Base) | | | | | | |
| Male | 21.3 | 22.2 | 6.1 | 35 | 165 | 2 |
| Female | 20.0 | 22.3 | 6.1 | 37 | 18 | - |
| OTHER RANKS (a) (11-12 Month Base) | | | | | | |
| Male | 25.8 | 27.7 | 10.1 | 35 | 285 | 3 |
| Female | 21.8 | 23.7 | 7.6 | 37 | 38 | - |

(a) excludes administrators

The interaction between the increased representation of women in the societies and the increased participation of women outside of academe is reflected in the differential median ages in Table 23. Women are only 3 years younger than their male colleagues in academe, but 7 years younger in other employment sectors. As indicated in Table 24, this effect is most pronounced in private industry, where women are 9 years younger than men. Thus, the contrast between men and women in years spent in the professional labor force should have its greatest effect on industrial salaries.

To control for these substantial differences in professional experience, the data were statistically weighted so that the age distributions of men and women were identical. The adjusted average salaries indicate that salary differences, although considerably reduced outside of academe, still remain as illustrated in Figure 17. Women earned, on the average, 7% less than men in nonacademe, but nearly 17% less in academe.

Further analysis of the adjusted age distributions indicate several phenomena. To some degree, women receive lower salaries than men within universities and 4-year colleges because they are more likely than men to remain in lower-paying, non-professorial ranks. Although average adjusted salaries are not far apart in nonacademe, the upper levels of the salary distributions for men and women of the same age are quite divergent. This may indicate differences in available career paths. Women are apparently still less likely than men to move into high-paying, administrative positions.

It should be noted that non-professional reasons may also account for part of the salary disparity noted above, for instance, breaks in professional career for child-rearing and periods of underemployment due to geographic moves related to the professional career of the spouse. However, there is currently no reliable data on how often these phenomena occur among society members. Thus, it is not possible at this time to evaluate their potential effect on the differential salary structures for women and men.

It is also not possible to determine the degree to which discrimination is the cause of salary discrepancies. Nevertheless, women are receiving lower salaries than men and there appears to be no evidence for the existence of hiring practices that give women preferred status.

## APPENDIX A : GEOGRAPHIC REGIONS

NEW ENGLAND
- Connecticut
- Maine
- Massachusetts
- New Hampshire
- Rhode Island
- Vermont

MIDDLE ATLANTIC
- New Jersey
- New York
- Pennsylvania

SOUTH ATLANTIC
- Delaware
- District of Columbia
- Florida
- Georgia
- Maryland
- North Carolina
- South Carolina
- Virginia
- West Virginia
- Puerto Rico

EAST NORTH CENTRAL
- Illinois
- Indiana
- Michigan
- Ohio
- Wisconsin

EAST SOUTH CENTRAL
- Alabama
- Kentucky
- Mississippi
- Tennessee

WEST NORTH CENTRAL
- Iowa
- Kansas
- Minnesota
- Missouri
- Nebraska
- North Dakota
- South Dakota

WEST SOUTH CENTRAL
- Arkansas
- Louisiana
- Oklahoma
- Texas

MOUNTAIN
- Arizona
- Colorado
- Idaho
- Montana
- Nevada
- New Mexico
- Utah
- Wyoming

PACIFIC
- Alaska
- Hawaii
- Oregon
- Washington
- California

## APPENDIX B: TECHNICAL NOTES

Employment Base

All salary data are presented for current society members who are full-time employed in the US. Academically employed students are not included.

Median

The median, a measure which is frequently used in this report, is that point in a distribution above and below which 50% of the values fall. Since it is less influenced by extreme values than the arithmetic mean, it is the preferred descriptive measure of central tendency in typically skewed salary and age distributions. In most of the tables, both median and mean salaries are presented; observed differences reflect the skewness in the distributions.

Quantiles and Interquantile Ranges

Ninety percent of the values in a distribution fall below the ninth decile, seventy-five percent below the third quartile, twenty-five percent below the first quartile and ten percent below the first decile. The interdecile and interquartile ranges, which indicate differences between deciles and between quartiles, are measures of variation within distributions and are used in several of this report's salary figures.

## Quantile Calculations

The SAS statistical package was used to compute the medians and other quantiles presented in the salary tables and figures. It should be noted that SAS works with an ordered distribution of value points. In such an ordered distribution the median, for example, equals the central point in an odd numbered distribution and a weighted value between the two middle points in an even numbered distribution.

## Sampling Error

The salary figures presented in this report may be affected by different sources of error. Society members who did not respond may have had somewhat different salaries than those who did respond, thus introducing response bias. Although earlier surveys in this series estimated that the effects of response bias were minor, the possible effect remains. A fuller explanation of response bias will be presented in the methodological appendix of the 1982 membership profile due to be published in the winter.

Since the data in this report are based upon a small random sample, they are also subject to sampling error. The variability introduced by the sampling procedure depends both on the size of the sub-group being examined, and the variation of values in the population. The formulas below present conservative estimates of the standard error based on simple random sampling. When standard errors were calculated, taking into account the minor stratification by society used in the sampling, slightly lower estimates resulted.

Proportions:

$$p \pm Z\sqrt{\frac{p(1-p)}{n}} \quad \text{where}$$

p = sample proportion observed.
n = sample size, and
Z = coefficient of confidence, 1.96 at the 95% confidence level.

Means:

$\bar{x} \pm Zs/\sqrt{n}$, where

$\bar{x}$ = the arithmetic mean,
s = standard deviation,
n = sample size, and
Z = coefficient of confidence, 1.96 at the 95% confidence level.

Medians:

$M_1$, that point below which $p_1^{th}$ values fall,
$M_2$, that point below which $p_2^{th}$ values fall,

where

$$p_1 = p + Z\sqrt{\frac{p(1-p)}{n}}, \qquad p_2 = p - Z\sqrt{\frac{p(1-p)}{n}},$$

and

p= 0.5,
n= sample size,
Z= coefficient of confidence, 1.96 at the 95% confidence level.

## Cost of Living Index

The cost of living index used in this report was developed by the American Chamber of Commerce Researchers' Association (ACCRA). Its purpose is to provide "a useful and reasonably accurate measurement of inter-city cost of living differences". The index measures "relative price levels for consumer goods and services in participating cities, as compared with the national average for all participating cities (metropolitan and nonmetropolitan)." Differences of more than three index whole numbers in the All-Items index can be considered to represent actual inter-city differences in the costs of consumer goods and services; but the percentage difference in such cases should be considered a reasonable indication, rather than a precise measure, of the extent of the differences.